Impact of an agglomerate of sodium diformate and monolaurate on the reduction of African Swine Fever virus in commercial pig feed

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Introduction

The African Swine Fever virus (ASFv) causes lethal disease in pigs with mortality rates up to 100%. The virus has spread in Asia and Europe (1) and has meanwhile reached the Caribbean. There is mounting evidence that feed or feed materials can serve as potential vectors for the introduction and transmission of AFSv (2). The application of various acids and their salts to diets for pigs has been studied extensively over decades. Numerous trials have demonstrated the mode and magnitude of action of organic acids as antimicrobials in feed for pigs and have established effective doses for piglets, fattening pigs and sows, among them the use of diformates (3). Recently, information has appeared that organic acids, e.g. formic acid (4) and medium-chain fatty acids, in particular monolaurate, may exert a certain anti-viral impact, also against the ASFv (5). However, there are some limitations (high dosages, in-vitro data). Data on a combined approach of organic acids and medium chain fatty acids are scarce. The current study therefore investigates the impact of an agglomerate of sodium diformate and monolaurate - an approved and tested feed additive for swine - on its ability to reduce the activity of the ASFv in feed.

Materials and Methods

The experiment was designed to evaluate the viability of ASFv (p72, genotype II) over time (0, 1, 3 and 7 days post-inoculation) in commercial swine feed containing either 0% or 0.3% of an agglomerate of sodium diformate and monolaurate (Formi 3G, ADDCON, hereafter abbreviated to 3G). The feed bags were incubated at room temperature (25°C) with a viral concentration of 10^8 HAD_{50}/mL. After the appropriate post-inoculation incubation period, the surviving virus was eluted from the samples using RPMI 1640 medium with 5% fetal bovine serum. Each treatment used a set of triplicate samples that were combined and used for a single titration and inoculation into cells. Virus titers (HAD_{50}/mL) were calculated by the Karber method (6). The quantity of ASFv was determined by real-time PCR to measure C_t-value. A significance level of 0.05 was used in all tests.

Results

Mean abundance rates of ASFv in the positive control as well as 3G-feed are shown in Table 1. The ASFv titration assay on cell cultures showed that the feed acidifier had a significant reduction activity against ASFv throughout the whole trial period, beginning only a few hours after the initiation of the trial. The 0.3% 3G inclusion into the diet was able to inhibit the virus within less than one hour significantly (P=0.013), from 4.72 to 3.99 Log_{10} HAD_{50}. From day 1 onwards, the reduction was highly significant (P<0.001). On day 7, the ASFv was inhibited completely.

Table 1. Relative abundance (Log_{10} HAD_{50}) of ASFv in positive control and 0.3% 3G-swine diets over time

Time	PC	Formi3G	Diff. (%)	*p*
Day 0	4.72^a	3.99^b	-81.4	0.013
Day 1	4.60^a	3.52^b	-91.7	0.0001
Day 3	4.07^a	2.15^b	-98.8	0.0002
Day 7	3.59^a	0^b	-100	0.0000

(a, b) Superscripts indicate statistically significant differences ($p \leq 0.05$)

Conclusions and Discussion

The addition of the agglomerate of sodium diformate and monolaurate caused a highly significant reduction of the viral load in swine feed – achieving complete inhibition of the virus after 7 days. The additive is therefore able to reduce ASFv infectivity in commercial feed at low dosages and can be consequently an economical and sustainable approach to curb the disease transmission while offering a strongly reduced infection probability for pigs that might consume virus-contaminated feed (7).

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